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CHAPTER 1

An Introduction to Maya

In This Chapter

Defining Maya

Painting a moving picture in a 3D world

Artwork and the computer

Maya's role in an animation production pipeline

What is Maya? Where did it come from? Where is it going? What is it used for? And who is using it? These basic questions, and many more, are addressed in this introductory chapter.

What Is Maya?

Maya is a 3D modeling animation and rendering software package, used by artists to make 3D models and animations. In fact, many of the world's leading films, TV programs, and commercials feature Maya-created 3D animations. For instance, hardly an hour passes without a Maya-created element appearing on a major television network.

As a computer graphic artist, I prefer to classify Maya as a program that creates moving artwork, such as that shown in Figure 1-1. In essence, Maya is a moving canvas on which to paint. And eventually, the Maya canvas is rendered with lighting, cameras, and dynamic effects. Now, even voxel space is painted using textures in XYZ space, such as a thick moving canvas.

3D software is perceived as simulating the real world. Perhaps, it's because of its depth. Or maybe, it's because it creates such believable 3D animation, using the real-world elements of gravity, collision, and light. But from an artist's perspective, working with 3D is as if you're painting on a wireframe and voxel canvas, which is then moved over time. In Maya, 3D is quickly becoming more than simulating the "real"; it is real. And Maya offers a wide assortment of artist-friendly tools to create this 3D animation.

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Figure 1-1: A 3D world with characters, animals, props, clothes, plants, and so on. This was shot by the iLumina project at Visual Book Productions. Some of the contributing artists are Shaun Comly, Phil Delacruz, Brent Hensarling, Jake Long, Nelson Saba, Adriano Silva, and Joe Spadaro.
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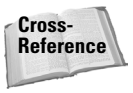
Maya's Strengths

Although Maya has many strengths, which enable you to perform numerous functions, Maya is best-suited for, and most often used in, real productions for the following seven tasks:

3D character animation

This not only includes character creation, but it also enables you to move and deform a character. It's similar to handling a marionette, but is much more flexible and specific. It also includes posing and animating final motion, and emotion. In addition, the process of creating 3D character animation requires that you perform just about all of the other major functions as well.



For more on 3D character animation, see Part VII, "Character Animation in Maya."

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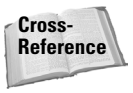
3D modeling

Perhaps, the best way to describe this function is 3D modeling clay, or creating 3D shapes. When you create a model in 3D, you use Maya's toolset to define shapes or geometry, much as a sculptor in the real world uses a practical toolset. The three surface types, used to describe a shape in Maya 4.5, are polygons, NURBS, and subdivision surfaces. Maya surface types describe a polygon surface that you view or render. 3D Models are used for many different functions including animation, design, manufacturing, previsualization, virtual reality, and games.



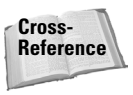
For more on 3D Modeling, see Part II, "Modeling."

Film and television special effects

This special effects function includes elements ranging from digital actors to character animation to virtual simulated worlds to lighting effects, to explosions to set generation to water splashes or sprays to flying logos. Most of the special effects that we see everyday in movies and on television are created in Maya. Sometimes the effects are so subtle and well-executed that we can't even detect them. Other times, the effects are so fantastic that we can't ignore the amazing special effect.

Particle and object dynamics simulations

Dynamics are used for scientific visualizations, and fluid simulations. Dynamics are also used with 3D animation that requires real world forces such as gravity or collisions. Rigid body dynamics affect shapes and surfaces. Particle dynamics affect points in space. They are very useful in simulating gasses and liquids, as well as large groups of objects or image sprites. Softbody dynamics use particles to animate the control points of a 3D surface. The Star Wars, Episode One, "Pod Racer" scene is the most notorious use of Maya's dynamic engine to create a fantastic effect.



For more on Dynamics, see Chapter 27, "Using Dynamics."

3D game animation

Maya has many tools designed to create 3D games with real-time rendering engines. Gaming requires a slew of tools to reduce computation times and still enable you to get a believable look though efficient use of texture space and surface geometry. Maya also enables you to previsualize the game engine, using game translators and real-time hardware rendering engines.

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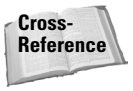
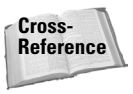


For more on Maya's game functions, see Chapter 5, "Polygon Modeling," in addition to bonus Chapter 39, "Using Subdivision Surfaces," and bonus Chapter 40, "Texturing Polygons and Subdivision Surfaces," both of which you'll find on the CD-ROM.

3D painting

In Maya, 3D painting takes on many meanings. Maya offers conventional 3D paint tools that enable you to just point and paint textures onto 3D surfaces, using a mouse or tablet. Additionally, Maya offers a unique form of volumetric particle painting that enables you to create shapes, and define organic surface types such as grass, hair, plants, trees, clouds, oil paints, smudges. It even enables you to create conventional airbrush effects in 3D space.



For more on 3D painting, see Chapter 28, "Using Paint Effects" and Chapter 14, "Using Artisan."

3D rendering

Simply put, 3D rendering is the creation of an image based on the way the computer scene file describes it. Maya is used for rendering final imagery for film and video. It is also used to render images for graphic design, and previsualization. Often times, products, such as watches, airplanes, boats, and cars are rendered to look real before they are manufactured or even sold.

For more on 3D rendering, see Part IV, "Rendering."

3D character animation

This where Maya shines. You can animate geometry to look like 3D characters using bones, bind skins and other deformers. This task becomes a lot like puppetry. You as the animator basically hook up digital strings and controls to your digital puppet and keyframe these over time.

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Maya's Roots

Maya's roots go as far back as the roots of 3D. It was a time when Alias and Wavefront, as separate companies, made up "two" of the "big three" leaders in 3D animation. The third leader was the company, Softimage, which was then purchased by Microsoft. Eventually, Silicon Graphics bought the two competing companies and pooled their years of tech savvy experience together, forming Alias|Wavefront. Alias and Wavefront both offered top-of-the-industry 3D packages. So, when the companies started working together, under one roof, they set out to make one, next-generation, super-app. The result was Maya.

Meanwhile, Softimage set out to create a next generation application called Sumatra, which became plagued with Microsoft's game plan, falling more than three years behind Maya's release schedule. Eventually, Softimage was purchased by Avid and Sumatra was finally released as XSI. During these three years, most of the high-end film and animation market shifted toward Maya. Maya proved its worth again and again. It's easy for artists to use. Its open architecture enables techies to tinker under the hood, rewiring the application's workings to custom suit the needs of the most demanding animators in the world.

To be fair, a lot of other 3D animation software companies were nipping at Alias|Wavefront's tail. The fierce competition in this industry is one of the reasons that 3D animation packages have become useful tools in the last decade. As a result, artists and technicians can now comfortably produce 3D animation. It is no longer an almost impossible feat.

Maya for Windows

In the beginning, high-end 3D packages were only available on costly Silicon Graphics computers, which were dedicated to this task and often used for little else in a production facility. Alias|Wavefront recognized that by porting to Windows, Maya would be available to a wider audience. In addition, its affordability would make it accessible to the masses.

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Maya for Windows opened up a new world of possibilities for the every day animator. My own personal history serves as an example of the difficulties in working with costly 3D animation packages and equipment. When I started using 3D animation software, the price of a SGI workstation and 3D software started at well over $60,000. And according to a friend of Don's, who started using Alias software at version 1.5, the software cost about $150,000. And the computer cost just as much as the software. Despite the hefty price tag, the results were limited — we could only create flying text and primitives.

Meanwhile, very few schools had a computer animation curriculum, let alone the SGI computers and 3D software needed, which are shown in Figure 1-2. I had to land a job at one of the few places that owned the equipment and software to cut my teeth as a 3D character animator. Creating dancing Campbells soup cans and flying MasterCard logos by day, enabled me to practice creating characters by night. Many people who entered the industry at that time had to follow similar paths because of the equipment's prohibitive cost. In addition, training was all but nonexistent.

Figure 1-2: Picture of Silicon Graphics Octane machines, which were the only computers in the past that were capable of running Maya properly. They are still used today by many of the leading entertainment companies. (c) 2003 Silicon Graphics, Inc. Used by permission. All rights reserved.

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Since then, as we all know, the price of computers has come down and the speed of desktop machines has increased dramatically, enabling software packages such as Maya to blossom and become accessible to beginning animators. A|W has also become very aggressive in pricing. It offers competitive discounts for those using other 3D applications, enabling them to get Maya for only a few thousand dollars. A|W has also introduced many educational programs, enabling students to gain access to this amazing software during the academic year for next to nothing. A|W even launched a program, called "A Taste of Maya," in which anyone can use the Windows version for one month for free.

Check out the competitive upgrades. Base Maya costs less than it used to be.

UNIX-based animators cringed at the thought of a Windows machine running graphics software. But the truth is, Windows offered a more affordable computer with a larger user base and desktop gaming forum. When Microsoft ported Softimage to Windows, it suddenly became an attractive alternative to SGI. It was affordable and, therefore, more accessible to all. But then Maya, which was owned by SGI, surprised everyone and announced a Windows port.

Although I'm still not ready to give up my UNIX workflow, it is a viable place to run Maya software. After becoming accustomed to the new OS and its work-a-rounds and kinks, I began receiving production through a predominantly Windows pipeline. The cost of a Windows render farm, shown in Figure 1-3, is less expensive now than in the days of per processor, node locked, money pits.

Maya for Linux

Because Windows operating systems have limitations that severely restrict the number of machines from processing large amounts of data across a large facility, UNIX must be available for large shops to incorporate these new low cost machines. Linux can be run on most PCs and is often the UNIX alternative. For this reason, Linux is being used to run Maya render farms. Many studios have adopted a double-boot system in which Linux automatically boots UNIX for the render farm if a user does not choose Windows from a timed prompt during startup. By choice, many animators use Linux as a base system.

The only real disadvantage in using a Linux system for graphics is the limited availability of other software packages and support. But many animators, and large production facilities that prefer UNIX, have turned to Linux as an equally cost-effective solution to Windows.

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Figure 1-3: Windows offered an affordable solution to the high cost of 3D animation. Here is an example of some multiple CPU rack-mounted Windows or Linux machines that can be used for rendering.

Maya for the Macintosh

At last! The long awaited release of Maya for Macintosh. Alias | Wavefront helped drive Apple computers to push their new UNIX-based operating system, OS X, and refine their use of open GL. Thanks to the hard work of Andrew Pierce and his development team, Maya is now available for Macintosh. We have to admit that when Steve Jobs and Richard Kerris announced and demonstrated this at Mac World for the first time, we felt a great deal of hope. This move breaks down the previous limits of the older Apple operating systems, enabling Apple to provide a unique advantage by combining the UNIX workflow performance, previously only possible on SGI computers, and the user friendliness of the next generation Macintosh. Apple and Maya users love the ease of use and artist-type workflow that an advanced GUI provides. It fits as nicely as the handle of a good brush. In contrast, UNIX users love the capability it provides for many users to tell a networked system specifically what to do, rather than sticking to predetermined choices, which only enable button pushing. Today, we have arrived at the crossroads, where the two worlds are meeting for the first time.

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I have always used a Mac alongside every SGI. The Mac is the place to do the "other stuff" such as paint, composite, typography, email, audio, and video — all the things Windows boxes offered without the 3D. But now, for the first time, Maya and Apple have brought these two digital worlds together.

With the release of OS X, Macintosh has just entered the UNIX world. It will take time, however, for all of the applications to catch up, including Maya. Maya 4.5 is feature compatible with Maya Complete on other platforms. But at the time of this writing, Maya Unlimited features are only available in one of the other solutions.

Macintosh OS X is undoubtedly the most sophisticated graphical user interface (GUI) to ever exist on a UNIX platform. It will eventually develop into the tool of choice for animators who prefer UNIX, an incredible GUI, and a wide selection of mainstream software. My initial experience with OS X was like driving a Ferrari. Very, very smooth!

Choosing an operating system

An OS choice has to be your choice, matching the kind of person you are with the kind of work you do with the kind of funds you have available. Each operating system has its pros and cons and you, as the end user, should try as many as possible before investing your hard-earned cash. In our opinion, Alias|Wavefront's Maya doesn't limited platform choices. In fact, it has done a wonderful job in expanding your options and ensuring that you can create high-end animation. But we live by the basic rules of production — use what has been proven to work in the past, and fully test new software and hardware before committing to its use in a large pipeline.

Overall, Maya is now more accessible and cost effective. Thus, it enables you, as an animator-in-training, to use the same tools that major studios use to create animations. You get out of Maya what you put into it. So you still have to acquire the skills and experience as everyone else in the art field. However, you won't be restricted by the software or hardware. Maya is both easy to use and powerful. It offers features, such as cloth dynamics for clothing, as shown in Figure 1-4. It offers grass and hair paint effects for creating 3D trees, flowers, clouds, and lightning, as seen in Sheena. Maya tracks camera moves. It has a particle dynamics engine explosive enough to create the blowing rain, waves, and spray, as seen in The Perfect Storm. With a rigid body dynamics system, Maya is capable of creating the amazing pod racer scene in Star Wars, Episode One. With character animation tools so strong, Maya enables animators to create believable — breathing, thinking, and feeling — beings, such as Stuart Little, Sheena, Mighty Joe Young, and Aladdin. Maya offers you the same tools as the top animators in the world. The only limits are your imagination and time.

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Figure 1-4: The team at Visual Book Maya created this animation of the Birth of Jesus for the iLumina project.
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Painting a Moving Picture in a 3D World

3D is really about painting a picture on a moving wireframe surface. As a result, you have the freedom to create any image you intend, rather than simply replicating the real world. While an artist can recreate their own world in a painting, you can push the limits of the real toward the hyper-believable. In Maya, you create NURBS, polygon, and subdivision surfaces. Then paint color on these surfaces, add lighting, create key poses over time, and render out the frames. This is an over simplified example of workflow, but it captures the basic concept. Creating 3D animation is similar to painting a picture that comes alive.

Computer artwork

The computer, yes, the computer has emerged as an art tool. It's just like a pencil or a brush. It renders artistic ideas, enabling artists to create works of art. All of the traditional rules of visual arts still apply — design, color, timing. As an animator, you must address these issues, and many more, with the skill of a designer, audio engineer, actor, and musician, sometimes all at once. Many major studios have now taken this approach. They also place an emphasis on creating believable design

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rather than replicating the real world. With that kind of studio philosophy found in many of today's shops, your artistry counts as much as your wizardry. Throughout this book, we stress learning artistic concepts, philosophies, and so on, as well as learning the software. The computer is just another tool for you, as an artist, to express your ideas, creativity, design concepts, and animation skills.

The Role Maya Plays in an Animation Production Pipeline

A "pipeline," as it is often referred to in the production world, is similar to an assembly line — ideas are fed into one end and images come out the other, such as the graph, shown in Figure 1-5. Numerous job functions are performed in the pipe in order to produce a product. This chapter is intended to more clearly define Maya's place in that pipeline.

In a real production pipeline, Maya is but one tool of many used to get from idea to imagery. Production starts with an idea. It may be in your head or on a napkin that your producer is carrying in his or her pocket. But it starts with an idea, which initiates the planning phase. Planning saves you time in 3D. So get your pencil and refine that idea yourself. Even if you are fortunate enough to have good storyboards, it is to your advantage to work out your own ideas on paper first. Audio is another important element in planning, which may lead to the creation of additional ideas. If you are lucky enough to get audio from the beginning, that's great! If not, your timing inspiration has to come from within. We often cut an audio track just to provide inspiration and a sense of time.

Next in the pipeline is an animatic. The best animatics are just scanned storyboards synced to time in a video editing application. Most major film studios have teams of people who contribute to these planning phases. Then they take these plans all the way through to color, lights, and camera moves. You can decide how far to go, depending on what you are working on.

You should also begin the modeling process by drawing your intended model with a pencil. Even if you have good drawings from the previous department or art department, draw a version from front and side perspectives anyway. This enables you to define spatial relationships in your own mind.

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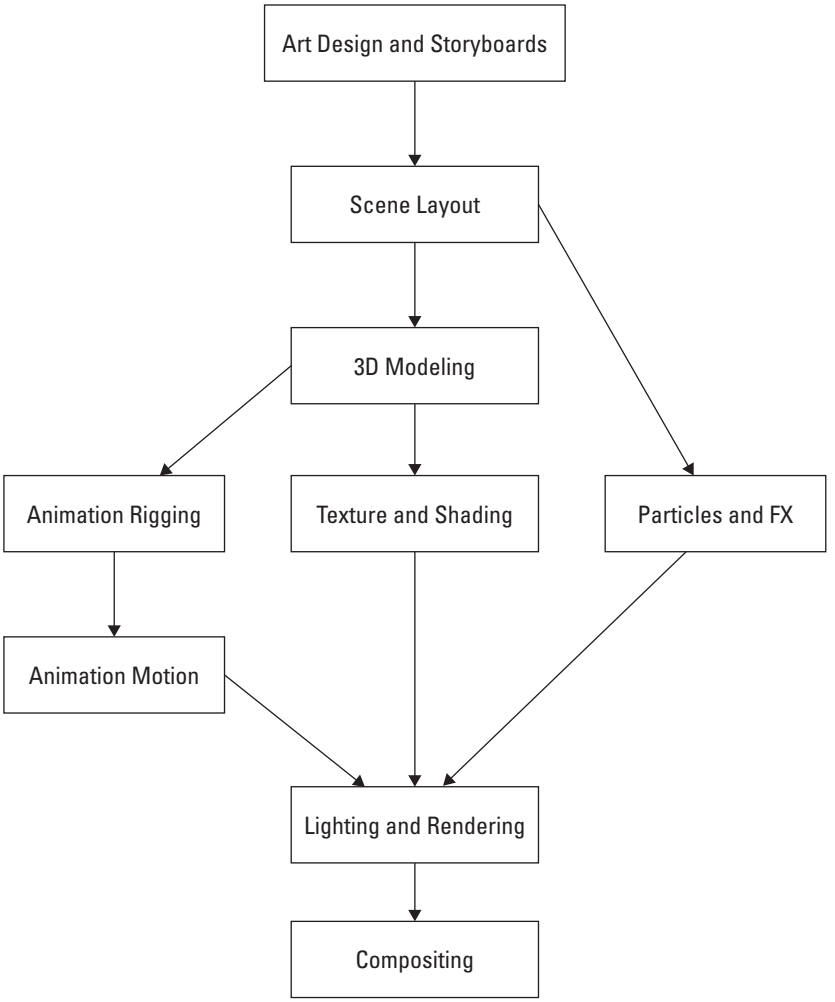

Figure 1-5: The simplified Maya pipeline typically includes the following sequence of tasks (not necessarily in this order): Art Design and Storyboarding, Sound Design, Layout, 3D ModelingTexturing and Shading, Animation Rigging, Particles and FX, Animation Motion, Lighting and Rendering, and finally Compositing and Video Editing.

Now that you have a plan, you are ready for Maya. In a real production pipeline, you typically use Maya to perform some of the following major functions (which are also illustrated in Figure 1-5):

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- **Art Design and Storyboarding:** Start planning with a pencil — not with Maya. Skipping this stage to save time usually costs much more time, so start with a pencil.
- **Sound Design:** The soundtrack is a must for believable animation. Animating to a soundtrack is one of the best ways to begin creating a rough draft. The soundtrack is usually created and edited outside of Maya in audio software. The audio track is perfected after animation edits are locked down.
- **3D Modeling:** This is where Maya usually kicks in. Use Maya's NURBS, polygon, subdivision surface modeling tools to create models. You may also use other 3D packages to create models for animation in Maya. While traditional 3D modeling is done using one of these surface types, you can even use fluid voxels to create volumes, particles, or paint effects, which will be textured, animated, and rendered later.
- **Texturing and Shading:** After you create a 3D model, you must add color. This can be done using images, painted within Maya or other paint packages such as PhotoShop, Shake, Painter, or Deep Paint. Procedural textures such as fluids, paint effects, particles, and lights, within Maya are also a way to get color and texture on to your Maya 3D surfaces.
- **Animation Rigging:** Rigging a 3D model is similar to putting strings and controls on a puppet. You as the animator create a series of controls that enable you to animate 3D surfaces, shaders, cameras, and lights. This can be as simple as putting a bend deformer on a 3D logo or as complex as creating skeletal and muscle deformers that bring realistic characters to life. Maya shines in this area. With its wide assortment of deformers, control widgets, and skinning tools, you can create believable characters using standard tools.
- **Particles and FX:** Maya, and other software packages, offers many ways to add effects (FX). The term FX usually refers to elements such as fire, water, hair, clothing, trees, and things that have scientific properties in the real world, which would be complicated to animate without some automation and insight. Maya provides several ways to create effects, using scientific properties that simulate the effects of forces on surfaces, particles, fluids, or paint effects. Often, effects are created manually, using photography, or animating in a creative way. A good FX artist must be well versed in science, math, and software packages. Perhaps, more importantly, an FX artist must be capable of inventing an effective way to achieve a specific effect. Although an artist can create fire using fluids every time fire is needed, an effective FX artist may simply find a movie clip from his library that is more believable, taking less time to create. And what if you need to create blood running down a character's arm? Achieving this effect with particles or fluids is time consuming. A more believable result, however, can be achieved using footage of dripping spray paint as a texture map. Just because an effect takes a long time and a lot of scripting to create in Maya, does not make it a good effect. Remember that it's more important to achieve an efficient and believable result when creating an effect.

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- **Animation Motion:** There are different ways to add motion. Keyframes are the most direct method to use, but you can also use motion capture, motion control camera information, expressions, and dynamics. A working knowledge of traditional animation helps here.
- **Lighting and Rendering:** At this stage, the computer figures out the appearance of 3D scenes, after calculating lights and shaders. A lighting artist must be knowledgable in photography and painting. Many new advancments are being made in this area to improve on previous techniques.
- **Compositing and Video Editing:** This is the point at which it all comes together. When you have produced the 3D imagery in Maya, you move forward to other types of software and hardware to refine and combine your images.

  Compositing in its simplest form is layering images. The compositor's job involves color correction, 2D morphing, lighting effects, blurring, filtering, rotoscoping, painting, and achieving a final look using a range of tricks and procedures that compositors have developed over the years. Sometimes you composite a 3D character on a live action background. Other times, you may composite the foreground over background. In the production world, the composite layer list often becomes quite long.

  Editing is sequencing together film, video, audio, and animation, in its final form. It is also a video editor's job to color correct, and create final special effects. A wide variety of software and hardware is used for editing, from computer based nonlinear systems for video and film to traditional linear tape editing to tape editing. When a film is edited in a nonlinear fashion, an edit description list (EDL) is produced in order to apply the edits back to physical film. Then it is the job of an online editor to maintain continuity among cuts and achieve a final look. Output is the final stage of any production pipeline. If you are producing computer movies, you may want to compress them for playback. If you are outputting video, you will export out to a DDR (digital disk recorder) or a computer with a hard disk playback system. For film, you use a film printer usually provided by a service bureau.

What's New in Version 4.5

Maya 4.5 offers many new features and improvements over previous versions.

Table 1-1 lists a few improvements made in customer learning.

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Table 1-1
Customer Learning Experience

Feature	*Description*
User interface improvements	These improvements include easy access to saved layouts, lasso tools, rotate tool snapping, align objects, selectable wireframe colors, automatic backup on save, progress bar, and new heads up display options.
New instant Maya books	Speeds the learning process through easy-to-understand examples.

Table 1-2 lists changes made to Basic features.

Table 1-2
Basic Features

Feature	*Improvement Description*
Subdivision Surfaces	Subdivision surfaces have been moved to the Maya Complete package. Thus, you get them with the less expensive "Complete" version of Maya, even on Mac OS X.
Version Parity on Mac OS X	Maya Complete features are the same on all platforms, including OS X. Maya Unlimited features are still only available on IRIX, LINUX, and Windows.
Fluid Dynamics (Unlimited Feature)	Maya Fluid Dynamics actually adds a slew of new features and concepts to the world of 3D animation. In order to facilitate fluid dynamics as an artist's tool, volumes of texturable voxels were added to the core of Maya's functionality and renderer. So, you not only have the ability to simulate fluids and oceans, you also have the ability to model and paint using voxels, sort of like 3D texturable pixels, shown in Figure 1-6.

Continued

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Table 1-2 *(continued)*

Feature	***Improvement Description***
New Shelves	Many new shelves have been added to provide collections of scripts for animation, modeling, dynamics fluids, fur, and so on.
New Snap Tools	From the main Maya menu, choose Modify ➪ Snap Align Objects ➪ Align Tool. From the main Maya menu choose, Modify Í Snap Align Objects Í Snap Together Tool.
New Transform Options	The following new options have been added to the move rotate and scale tools: discrete, retain component spacing, snap to live polygon face or vertex, UV snapping and scale axes constraints.
Select Hierarchy	From the main Maya menu, choose Edit ➪ Select Hierarchy. Note: previously users often had to type **select –hi** to achieve this result.
Rename Multiple Objects	Select Multiple Objects. In the status bar Selection field, choose Quick Rename from the RMB pop-up menu. Then type a new name. Note: previously this required a custom script.
Wireframe Smoothing	This feature is nice for screen shots and playblasts that need to be played on video or printed.
Annotation Nodes	These little pointer locators do callouts in 3D. Select an Object. From the main Maya menu, choose Create ➪ Annotation. Type the text you would like to appear. Then LMB-click the OK button.
Duplicate Naming Option	New Assign Unique name to Child choice in Duplicate option box.
UI Improvements	There are also many miscellaneous UI and window changes that enable you to customize Maya, according to your needs.

Figure 1-6 shows an example of fluids and voxels.

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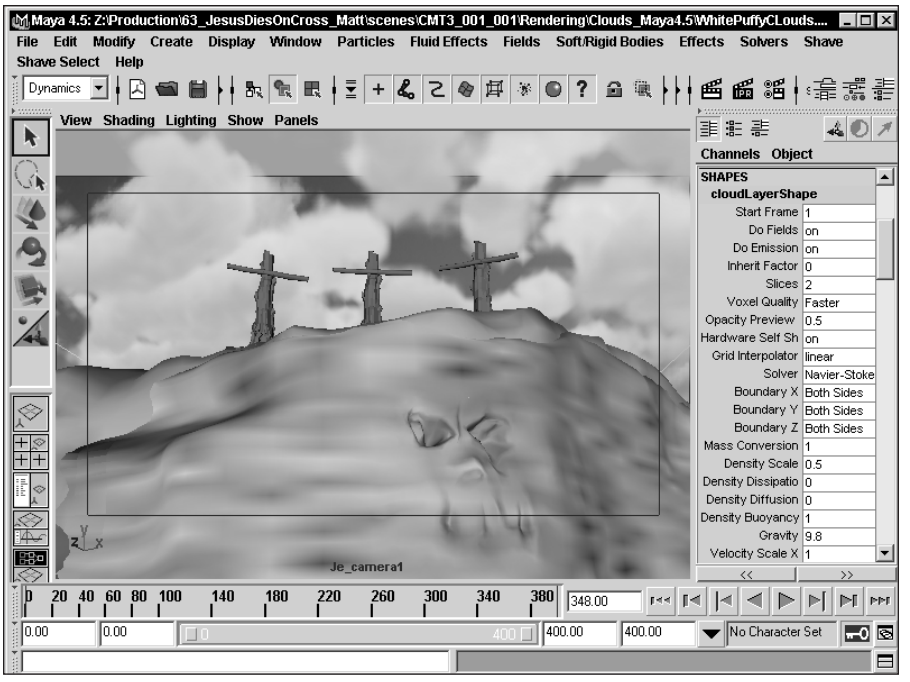

Figure 1-6: Fluids add voxels, a new type of rendering that offers many benefits.
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Table 1-3 lists changes made to the Attribute Editor Window.

Table 1-3
Attribute Editor Changes

Feature	***Improvement Description***
Note Section	As shown in Figure 1-10, this feature adds a notes attribute to keep track of user or project notes.
Attribute Editor Presets	This is bigger than it sounds. It basically amounts to animation poses for attributes. To create a preset, set the attribute values you would like to store. Then from the LMB Presets pop-up menu, choose Save Transform Preset. Note: When choosing a preset, you can also choose a percentage. This feature amounts to single node pose blending.

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Node connections are not saved with the presets.

Figure 1-7 shows the new notes section of the Attribute Editor.

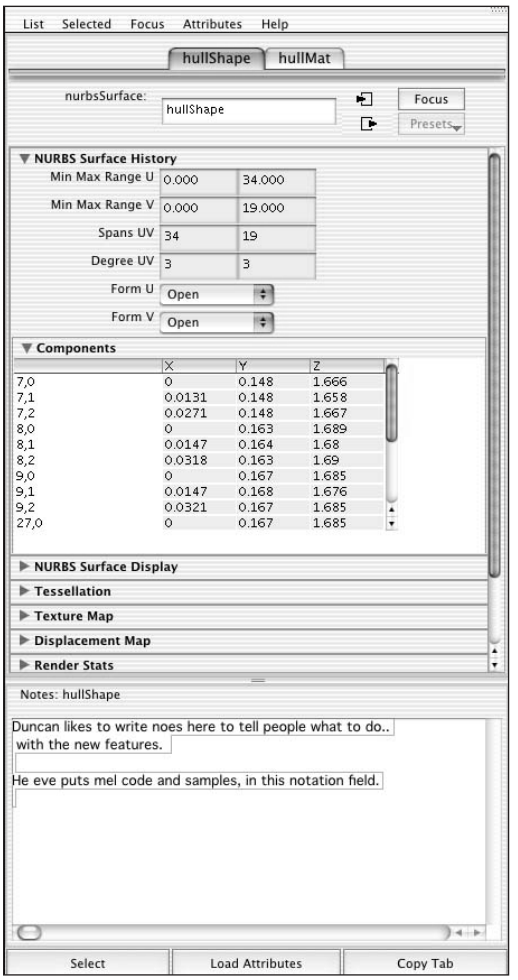

Figure 1-7: The new notes section of the Attribute Editor

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Table 1-4 lists changes made to Marking Menus.

Table 1-4
Marking Menu Changes

Feature	***Improvement Description***
Keyframing	Shift+S+LMB-drag
Keyframe Tangent Editing	Shift+S+LMB-drag
Poly Tool Brush	O+LMB-drag
Poly UV Tool Brush	O+MMB-drag
Poly Component Conversion	Control+RMB-drag
NURBS Selection Propagation	Control+RMB-drag
Subdivision Component Conversion	Control+RMB-drag
Translate, Rotate, and Scale	New items were added to the w e and r LMB marker menus.
History	History Marker Menus were renamed. Type **A**+LMB-drag
Animation	Shift +S LMB-drag

Table 1-5 lists changes made to Animation features.

Table 1-5
Animation Changes

Feature	***Improvement Description***
Show Base Wire	Wire deformer has show base wire and grouping options.
Nonlinear Deformer	Nonlinear deformers have more interactive manipulators.
Component Mirror/Copy Weights	Mirror and copy weights now work on component selections.
Orient Joint menu item	Note: Previously users had to use MEL command joint -e –oj;

Continued

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Table 1-5 *(continued)*

Feature	***Improvement Description***
Mirror Joint Renaming option	You now have new naming options in the Mirror Joint Tool.
Orient and Aim Constraint Offset attributes	You can now offset and keyframe orient and aim constraints.
Time Snapping Default On	Time snapping in the graph editor now defaults to On, instead of Off.
New Marking Menus	Shift+S LMB-drag.
Import Clip to Character	You can now import a clip to the active character.
Hierarchy option for Clip Creation	You can now enable a Hierarchy option for clip creation.
Improved Clip renaming	When renaming clips in the Trax editor, the source clip name is now also edited.

Table 1-6 lists changes made to Modeling features.

Table 1-6
Modeling Changes

Feature	***Improvement Description***
Bevel Plus	The new Bevel Plus tool for NURBS curves enables you to quickly create extrudes with intricate preset profile choices and end caps.
NURBS, Polygon, and Subdivision marking Menus	Control+RMB-drag.
Cut Faces	Cut faces enables you to swipe a line across a polygon surface or faces split each polygon that your UI line intersects, giving you a nice continuous straight split across your entire selection.

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Feature	***Improvement Description***
Poke Faces	Poke Faces splits a polygon into separate faces that converge at the center of the previously existing selected polygons.
Wedge Faces	Wedge Faces extrudes a wedge that pivots on selected edges.
Edit By Painting	You can now apply many polygon tools with an Artisan brush.
Smooth Proxy	Smooth proxy enables you to bring subdivision type cage modeling to the polygon world. This provides some advantages over subdivision cage modeling, because it keeps you in the polygon world of tools.
Exponential Smoothing	You now have two types of smoothing choices, linear (older method) and exponential, which provide some improvement and capability to adjust polygon smoothing.
Improved Snapping Functions for Components and UVs	You can now snap to UVs in the texture editor, and use many other new snapping functions.
Component Selection Conversion	These new component selections conversion options, are a big help when selecting different types of component selections.
Wrap and Transparency support in the UV Texture Editor window	The UV texture editor now supports wrap and transparency.
Convert Subdiv to NURBS	This new feature amazes everyone because you can go from polygons to subdivision surfaces to NURBS. *Note:* It helps to model in quads.
Subdivision UV editing improvements	UV editing in both standard and polygon proxy mode.

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Table 1-7 lists changes made to Dynamics features.

Table 1-7
Dynamics Changes

Feature	*Improvement Description*
Hinge Constraint Axis Rotation	Hinge constraint type now has axis rotation. The old hinge constraint type was renamed to Directional Hinge.
Particle shadow casting	Particle shadow casting for point, multipoint, and sphere particle types.

Table 1-8 lists changes made to Rendering features.

Table 1-8
Rendering Changes

Feature	*Improvement Description*
Volume Light	Volume light illuminates based on a Volume Manipulator. This is awesome for localizing light without messing around with falloff.
Height Field utility node	Height field visualization utility node. Note: This is great for visualizing displacements in real time.
Use No Lights	Use No Lights hardware shading menu item.
Jitter Final Color Render Global	Jitter Final Color reduces banding by adding noise to your rendered image.
Pause IPR Tuning	You can now pause and resume IPR tuning.
Surface Materials	Ramp shader and Ocean shader (Unlimited feature), shown in Figure 1-8.
Volumetric Materials	Fluid shape (Unlimited feature).
2D Textures	Ocean (Unlimited feature).
3D Textures	Fluid Texture 2D (Unlimited feature) and Fluid Texture 3D (Unlimited feature).

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Figure 1-8 shows the new Ocean shaders.

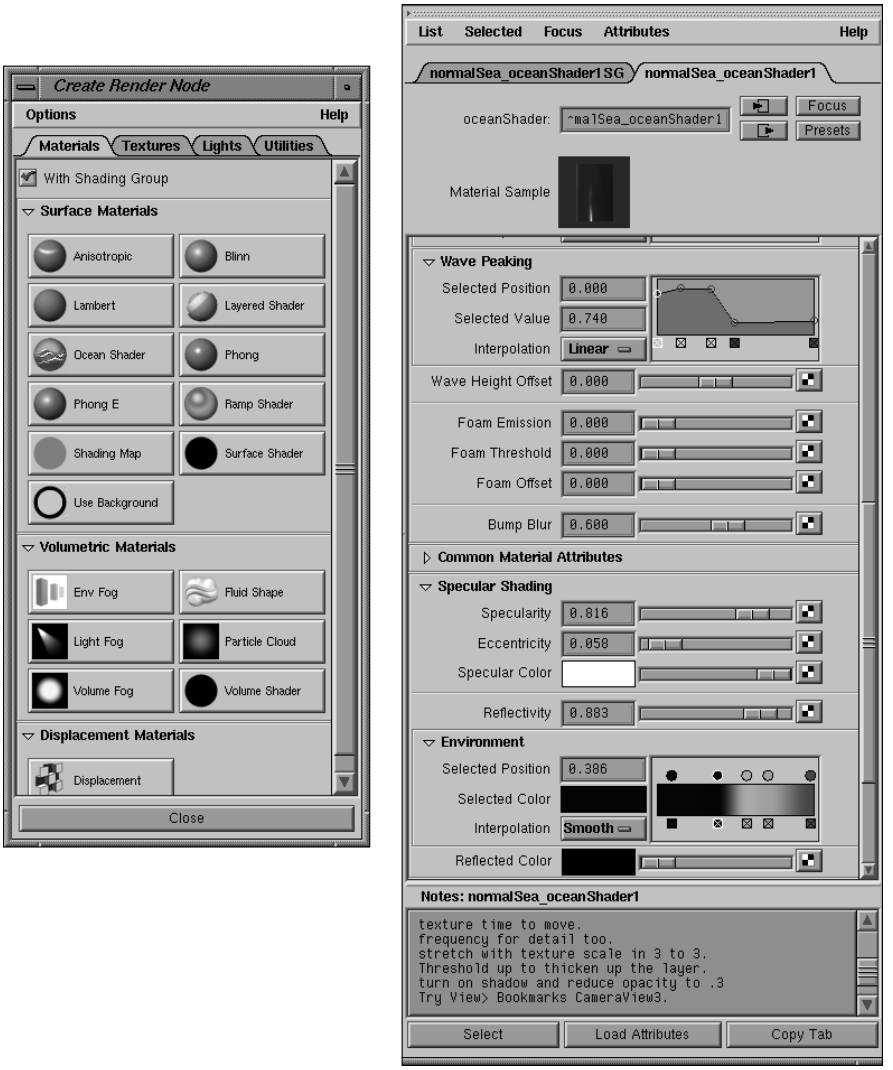

Figure 1-8: The new Ocean shaders

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Table 1-9 lists changes made to the Hypershade Window.

Table 1-9
Hypershade Window Changes

Feature	*Improvement Description*
Convert to File Texture background options	When converting to file texture, you now have a few background options, which avoid some common issues associated with background edges.
Add/Remove Node to Graph	You can now select nodes and add or remove them from your existing Hypershade graph.
Show Previous/Next Graph	You can now toggle between previous and current Hypershade graphs.
Select Input/Output nodes	You can now quickly select entire input and output graphs for easier manipulation.
Resize Create Bar	You can now resize your create bar as you do with other windows.
Drag-drop connection defaults	New MMB and Control drag-drop connection defaults.
Transparency hardware support	Shaders now have better transparency hardware support.
Improved swatch refreshing control	You have a few new ways to force swatch refreshing in the Hypershade Projects tab.

Table 1-10 lists changes made to Hardware Shading features.

Table 1-10
Hardware Shading Changes

Feature	*Improvement Description*
Improved Combined Texture	Combined textures now display in hardware.
Texture Wrapping support	Hardware texture wrapping has been improved.
Hardware shader attribute	A new hardware shader attribute has been added to target hardware rendering.
File Texture Transparency connection	File texture transparency now has to be connected to control transparency.
Mirror U and V are now separate	U and V have been separated to enable individual control.

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Table 1-11 lists changes made to Artisan features.

Table 1-11
Artisan Changes

Feature	*Improvement Description*
Paint Fluids tool (Unlimited only)	Enables you to use Artisan to paint fluid property values into fluid containers.
Paint Selection tool	Paint selection tool now performs some polygon modeling functions.

Table 1-12 lists changes made to Fur features.

Table 1-12
Fur Changes

Feature	*Improvement Description*
Fur file names prefixes	File names now contain scene prefix.
Multiple UV set support	Multiple UV sets are now supported for fur creation.
Offset attribute	You can now offset fur from the surface of your object.
Improved naming	Improved naming for UNC Windows paths and Use Namespaces.
Improved lighting support	Use default lights and light linking are now supported.
Render Layer Support	Fur now respects render layers.
Scripts and presets	The new shelf with many helpful presets and scripts.

Table 1-13 lists changes made to Translator features.

Table 1-13
Translator Changes

Feature	*Improvement Description*
OpenFlight Importer/Exporter	For gaming and interactive previsualization.

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Menu changes

The menu changes in Maya 4.5 include version parity for Mac OS X, which was previously at version 3.5. For this reason, some changes to menus from as far back as version 3 are listed here. If you are already familiar with some of the menu changes, you have less to learn. The following lists many of the new or changed menus in Maya 4.5:

Main Maya menu

The main Maya menu is across the top of your Maya window and is also the top menu in your Hotbox.

File

- ✦ Save Scene options

Edit

- ✦ Invert Selection
- ✦ Duplicate with Transform

Modify

- ✦ Snap Align Objects ➪ Align Objects
- ✦ Evaluate nodes and Disable nodes are combined (was Enable/Disable)
- ✦ Evaluate Nodes ➪ Global Stitch
- ✦ Make Not Live (menu changes dynamically)
- ✦ Edit attribute (was Rename attribute)

Convert

- ✦ NURBS to Polygons (moved from the Polygons Modeling menu)
- ✦ NURBS to Subdiv (was included in Subdiv Create Modeling Options)
- ✦ Polygons to Subdiv (was included in Subdiv Create Modeling Options)
- ✦ Subdiv to NURBS
- ✦ Displacement to Polygons
- ✦ Fluid to Polygons (Unlimited Feature)

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Create

- ✦ Subdiv Primitives
- ✦ Volume Primitives
- ✦ Cameras
- ✦ Camera
- ✦ Camera and Aim
- ✦ Camera, Aim, and Up
- ✦ Create Empty Group (Moved from Edit menu)
- ✦ Heads Up Display ➪ Object Details
- ✦ Animation Details
- ✦ Camera Names
- ✦ Sets (Moved from Edit menu)

Display

- ✦ Hide/Show ➪ Animation Markers (was Markers)
- ✦ Wireframe Color
- ✦ Object Display ➪ Ghosting/NoGhosting
- ✦ Subdiv Surface Components ➪ UVs/UV Borders

Windows

- ✦ General Editors ➪ Visor (moved to submenu)
- ✦ General Editors ➪ Display Layer Editor (removed)
- ✦ Render Editors ➪ Render Globals (moved to submenu)
- ✦ Render Editors ➪ Hypershade (moved to submenu)
- ✦ Animation Editors ➪ Trax Editor (moved to submenu)
- ✦ UV Texture Editor (was Texture View)

Help

- ✦ Alias | Wavefront on the Web

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Animation Menu

The Animation menu appears next to your Main menu in the top menu bar the Animation mode is chosen. The Animation menu can be set to always appear in the Hotbox.

Animate

- ✦ Set Key (new option)
- ✦ Set Transform Keys
- ✦ Move (Shift+W)
- ✦ Rotate (Shift+E)
- ✦ Scale (Shift+R)
- ✦ IK/FK Switching Keys ➪ Set IK/FK Key
- ✦ IK/FK Switching Keys ➪ Enable IK Solver
- ✦ IK/FK Switching Keys ➪ Connect to IK/FK
- ✦ Create Motion Trail
- ✦ Update Motion Trail/Snapshot
- ✦ Motion Paths (was Paths)
- ✦ Motion Paths ➪ Set Motion Path Key (was Set Path Key)
- ✦ Motion Paths ➪ Attach to Motion Path (was Attach to Path)
- ✦ Create Animation Snapshot (moved from the Modify menu)
- ✦ Create Animated Sweep (moved from the Modify menu)

Deform

- ✦ Create Jiggle Deformer
- ✦ Create Jiggle Disk Cache
- ✦ Jiggle Cache Attributes
- ✦ Paint Jiggle Weights Tool
- ✦ Paint Cluster Weights Tool (was Paint Weights Tool)

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Skin

- ✦ Edit Smooth Skin ➪ Export Skin Weights Map
- ✦ Edit Smooth Skin ➪ Import Skin Weights Map
- ✦ Edit Smooth Skin ➪ Prune Small Weights
- ✦ Edit Smooth Skin ➪ Remove Unused Influences

Character

- ✦ Create Character Set (moved)
- ✦ Merge Character Set
- ✦ Select Character Set Node (was Select Character Node)
- ✦ Select Character Set Members (was Select Character Nodes)
- ✦ Set Current Character Set (was Set Current Character)

Modeling Menu

The Modeling menu appears next to your Main menu in the top menu bar when the Modeling mode is chosen from the Status Bar pull-down menu. The Modeling menu can be set to always appear in the Hotbox.

Edit Curves

- ✦ Move Seam
- ✦ Edit NURBS (was Edit Surfaces)
- ✦ Attach Without Moving
- ✦ Move Seam
- ✦ Smooth Tangent
- ✦ Selection ➪ Grow CV Selection
- ✦ Selection ➪ Shrink CV Selection
- ✦ Selection ➪ Select CV Selection Boundary
- ✦ Selection ➪ Select Surface Border

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Polygons

- ✦ Tool Options ➪ Reset to Default Settings (was Uninstall Current Settings)

Edit Polygons

- ✦ Sculpt Polygons Tool (moved from Polygons menu)
- ✦ Straighten UV Border
- ✦ Merge UVs
- ✦ Select Contiguous Edges
- ✦ Colors ➪ Set Vertex Color Key

Subdiv Surfaces

- ✦ Texture ➪ Planar Mapping
- ✦ Texture ➪ Automatic Mapping
- ✦ Texture ➪ Layout UVs
- ✦ Standard Mode (was Hierarchy Mode)
- ✦ Match Topology
- ✦ Clean Topology
- ✦ Collapse Topology

Dynamics Menu

The Dynamics menu appears next to your Main menu in the top menu bar when it the Dynamics mode is chosen from the Status Bar pull-down menu The Dynamics menu can be set to always appear in the Hotbox.

Particles

- ✦ Sprite Wizard

Fluid Effects,

- ✦ This is a whole new menu item, as shown in Figure 1-9.

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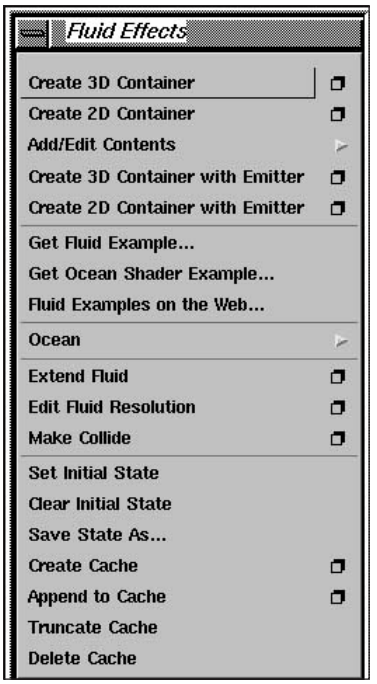

Figure 1-9: The new Fluid Effects menu under Dynamics

Soft/Rigid Bodies

- ✦ Paint Soft Body Goal Weights Tool

Pane menus

There are as many different Pane menus as there kinds of Panes in Maya. Below is listed some new additions to 3D Pane Menus.

Shading

- ✦ Hardware Texturing
- ✦ Hardware Fog

Show

- ✦ Isolate Select ➪ Auto Load New Objects

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Summary

In this introductory chapter, we discussed the concepts behind Maya and its major functions in different professional settings. Maya is such a flexible application, capable of performing just about any computer function you desire. We encourage you to push the boundaries of Maya and create and define your own uses. We also touched briefly on Maya's history and the new features in version 4. We covered the following:

- ✦ What Maya is
- ✦ Painting a moving picture in a 3D world as it applies to Maya
- ✦ Artwork
- ✦ The role Maya plays in an animation production pipeline
- ✦ What's new in version 4.5

✦ ✦ ✦